TWS 9: Action Research: Research on Student Learning

TWS Standard: The teacher reviews and interprets relevant literature and uses assessment data to profile student learning and communicate information about student progress and achievement. The analysis of student work engages the teacher in reflection of their practice to make future instructional decisions.

Task 1: Written review of research related to topic selected (Fall Term)
The purpose of Task 1 is to select an instructional strategy of interest and study it in-depth. This is in preparation for the research study you will design during the fall semester and conduct during full time student teaching.

Prompt:
- **Topic Selection**: Select a specific strategy to focus on for your research study from the following choices:
    - establishing *flexible grouping strategies* to increase student engagement, understanding and performance
    - creating *tiered assignments* to meet varying student readiness levels
    - using *student self evaluation or reflection* to enhance comprehension and/or monitor academic goals
    - designing lessons with *choices* to meet student interests and/or learning styles for increased motivation and engagement

- **Read Relevant Literature**: Review *scholarly resources* relevant to your selected strategy. Include sources that highlight utilizing the instructional strategy with specific populations of students to ensure a breadth of perspective. These include students from diverse backgrounds and with special learning needs. You should read a minimum of 12 scholarly resources before writing your paper.

- **Written Review of the Literature**: Write a research paper, or "literature review", that summarizes the key points of the resources you read. This should emphasize the positive impact on student learning the strategy you selected will have in a diverse classroom. Please use APA formatting and the following outline to guide you:
    - Introduce the rationale of the strategy as an effective way to increase student achievement.
    - Clearly establish the purpose of the paper.
    - Organize the body of the paper with subheadings.
    - Conclude with recommendations on how you may use this strategy in your student teaching classroom.
    - Write your paper using APA 6th edition citation style. The paper should cite at least 8 resources.

  Length: 8-10 pages

#9 Review of Related Research Literature Rubric

Rating → Indicator ↓	Below Standard	At Standard	Score/Comments
Writing quality	Errors present in conventions, grammar, or organization. Writing is not concise, or not in an acceptable technical style, or does not use APA style.	Writing flows smoothly, is clear, and includes transitions. No convention, grammar, or citation errors. Subheadings included to aid in organization. Reviewed by 1 or 2 peers.	
Analysis of research based studies of student learning	Only a partial analysis of related studies is provided. Broad based support for pedagogical decisions is included, but specific details of research studies, such as methods and contrasting points of view, are missing or incomplete.	A thorough analysis of research studies related to topic is provided. The review provides the reader with clear understanding of prior studies, including methods used, and contrasting points of view.	
Evaluation of effectiveness of research based instructional method	The summary description of recommendations related to instructional methods and curriculum is incomplete. A limited—rather than clear—focus on analysis of impact of method/curriculum on learning of all students.	The summary of research is well organized, effectively using supporting instructional methods/curriculum to address the stated purpose. The analysis of impact of the methods/curriculum on learning of all students is described with clarity	

Writing Quality

Flow and organization	1	2	3	4	5
Editing	1	2	3	4	5

Analysis

At least 10 appropriate sources are used to substantiate and describe the teaching strategy clearly	1	2	3	4	5
Pros and cons of the strategy are addressed and clarified	1	2	3	4	5

Evaluation of Effectiveness

Benefit of the strategy for different learners is described	1	2	3	4	5
Summary of effective strategy use and potential limitations in your classroom is provided	1	2	3	4	5

5=exemplary work and demonstration of understanding, many examples and descriptors support writing
4=very good, demonstrates understanding the key ideas, but does not elaborate more than necessary
3=good, demonstrates understanding the key ideas overall, but contains some errors or minor flaws
2=below standard, weak understanding demonstrated and/or few examples provided to substantiate work
1=limited understanding demonstrated and/or incomplete sections

Task 2: Action Research Plan (Fall Term)

The purpose of Task 2 is to develop a plan to study the instructional strategy you selected and its impact on student learning.   The Action Research Study will be conducted during the Spring term when you are student teaching full time.

Prompt:
- **Research Question:** Define your research question for the project. This should be directly linked to your literature review completed in Task 1.
- **Learning Goal**: Select one or two learning goals in a unit you will be teaching in the Spring to focus the study on.
- **Whole Class, Subgroup and Individual Selection**: You will decide on a whole class group (one elementary class or one class period for secondary) to focus the study on. In addition, identify a subgroup in the class to study separately by group characteristic, such as gender, socioeconomic level, or performance level. At least two individuals should be selected as well. The identification of the groups and individuals within the whole class will be used for data analysis purposes to see if the impact of the teaching strategy studied differs for different populations.
- **Development of Action Research Plan**: Create a plan to collect student work samples or other assessment data during the unit you are teaching and gathering your data. Consider the following questions when creating your plan:
    - Purpose: Why are you collecting the data? How is the data related to the focus area and question? What will the data tell us about student learning and teaching strategies?
    - Establish Criteria: Has the criterion for analyzing the data (rubrics, checklists) been established BEFORE the data is collected?
    - Identification of Data Needed: What exactly are you collecting? What kind of data will give you the best information about student learning and the teaching strategy? Gather data on the same question in different ways, from different sources, and at different times (triangulation). Make sure you have pre, formative and summative data samples.
    - Identification of Assessment Methods: Where are you going to collect it? What kind of a sample is needed? Do you need to get more or less from your identified subgroup or individuals?
    - Timeline: When are you going to collect it and for how long? How much data is needed? How periodic should the collection be?
    - Researcher: Who is going to collect it? Are you going to be the sole collector of data or can your mentor teacher help?
    - Data Analysis: How will the data be collected, analyzed and findings shared? Where and how will the data be stored?
- **Written Action Research Plan**: Put the steps for Task 2 listed above into narrative form using the following guidelines:
    - Introduce what you will be studying and why.
    - Describe your classroom and how the strategy will positively impact student learning.

- Briefly describe the unit you will be teaching during the study and its learning goals.
- Describe the subgroup and individual selection, including a rationale for selection for each.
- Describe the Action Research Plan. Use the underlined subheadings in your paper.
- Conclude your paper with final thoughts and considerations about conducting action research in your classroom.
- Create an Appendix to include the checklists or rubrics that you will use to record your findings and establish your criteria for your observations.

Length: 6-8 pages

#9 Action Research Plan Rubric

Rating → Indicator ↓	Below Standard	At Standard	Score/Comments
Plan clarity and completeness	The plan is difficult to understand or subgroup or individual students are not selected and rational described.	The assessment data plan is clear, well organized, and well presented. The rationale for the choices of subgroup(s) and individuals is clearly described.	
Whole class assessment descriptions	Assessments only generally described.	A clear, brief, but comprehensive description of assessments is given to related to whole class pre-, formative, and post-testing	
Description of how data will be used for individuals.	The description of how the data will be used to assist targeted students in meeting the learning goal is missing or lacks clarity and alignment with predetermined goals related to the general topic/question.	The plan includes discussion on data gathering strategies for the individual students, as well as how it shall be used to assist these students in meeting the predetermined learning goal related to the general topic/question.	

Task 3: Action Research Study Results (Spring Term)

The purpose of Task 3 is to analyze the data you collected during your Action Research Study and report your findings.

Prompt:

- Analyze your data using your pre-established criterion (rubrics, checklists, test scores, etc.). Use *descriptive statistics* and *qualitative analysis* of student work to answer your research question and determine if the strategy positively impacted student learning based on your learning goals.
- Organize your findings. This can be done by theme, chronologically, or by assessment tool used to collect data.
- Report your findings in narrative form using the following guidelines and subheadings:
  - <u>Introduction</u>: Overview of the study and how it was conducted. This may be as simple as introducing the data analysis by restating the purpose and general design or act as the time to describe how you made changes to the original plan and what you actually did.
  - <u>Evidence of impact on student learning</u>: Summarize your findings in narrative, tables, and/or figures for the whole class, subgroups, and individuals. Also provide student samples if possible, such as quotes or actual work samples. Make sure your findings link directly back to your research question and learning goals.
  - <u>Insights on effective instruction and assessment</u>: Discuss if students were successful in achieving the learning goal(s) established using the strategy you selected and why or why not. In addition, what population of students benefited the least and most as a result of the strategy you studied? Why?
  - <u>Implications for future teaching</u>: Discuss successful practices that you'll continue and changes you will make in the future to improve student learning.

  Length: 6-8 pages

#9 Action Research Study Results Rubric

Rating → Indicator ↓	Below Standard	At Standard	Score/Comments
Clarity and Accuracy of Presentation	The presentation is difficult to understand and contains errors.	The presentation is easy to understand and contains no errors.	
Alignment with Learning Goals (& the topic/question and general purpose)	The analysis of student learning is poorly aligned with the learning goal(s) The profile of student learning is inadequate/incomplete related to the original purpose, topic/question, and learning goals for the whole class, subgroups and individuals.	The analysis is fully aligned the original purpose, topic/question, and learning goals for the whole class, subgroups, and individuals. The analysis is comprehensive and logically organized.	
Interpretation of Data	The interpretation is technically accurate, but conclusions are missing or not fully supported by data.	The interpretation is meaningful and appropriate conclusions are drawn from the data.	
Evidence of Impact on Student Learning	The analysis of student learning includes incomplete evidence of the impact on student learning of students who achieved and made progress toward learning goal(s), purpose, and topic/question.	The analysis of student learning includes evidence of the impact on student learning in terms of students who achieved and made progress. This analysis is carefully aligned to the learning goal (s), purpose, and topic/question. The analysis and explores multiple reasons for students' success or lack of success	
Insights on Effective Instruction and Assessment	Effective and ineffective activities or assessments are identified, but are only superficially explored. Theory, data, and experience at not effectively used	Effective and ineffective activities or assessments are identified and plausible explanations (based on theory or research) for the outcomes—both successful and unsuccessful aspects—are provided.	
Implications for Future Teaching	Reflections on and implications for redesigning learning goals, instruction, and assessment are included, but no rationale is provided for, i.e. why these changes would improve student learning.	Reflections on and implications for redesigning learning goals, instruction, and assessment are provided for, i.e., why these modifications would improve student learning.	

Definition of Terms

- **Action Research**: A form of teaching; a form of reflective practice and professional learning founded on an ethical commitment to improving practice and realizing educational values. Action Research involves individuals and groups identifying areas for improvement, generating ideas, and testing these ideas in practice. It is characterized by cyclical, critical reflection and action, and collaboration. As research, it is systematic, self-critical inquiry made public (Holly, et. al, 2005, p.297).

- **Descriptive Statistics**: A set of calculations used to summarize data collected (Holly, et. al, 2005, p.320-321).
  Mean: The mean is the average, and is computed by summing all scores and dividing by the number of scores.
  Median: The median is the midpoint in a series of scores. Fifty percent of the cases lie above the median, and 50 percent lie below the median.
  Mode: The mode is the most frequently occurring score.
  Range: The range is the span between the lowest score and the highest score. It is useful in summarizing the variability of scores.
  Standard Deviation: The standard deviation is another measure of variability. It is the difference between a single score in a data set and the mean for the data set.

- **Flexible Grouping**: Students are a part of many different groups-and also work alone- based on the match of the task to student readiness, interest, or learning style. Teachers may create skills-based or interest-based groups that are heterogeneous or homogeneous in readiness level. Sometimes students select work groups, and sometimes teachers select them. Sometimes student group assignments are purposeful and sometimes random (Tomlinson, 2001, p. 102)

- **Journaling:** A form of reflective writing that can be in response to a specific prompt or question or just free flowing thoughts on a given topic.

- **Literature Review**: Both a process of studying and critically reviewing literature pertinent to one's research topic and area, and the product of such review, usually included in a formal proposal and/or report. More than a listing or presentation, literature reviews provide analysis and synthesis of key studies and present these in such a way that the reader learns more about the literature as a whole than about any of its constituent studies and reviews (Holly, et. al, 2005, p.297).

- **Qualitative Analysis:** Analysis of qualitative data. Qualitative data is the information gathered from sources that are not numerical. Qualitative data seeks to analyze and explain human behavior. For example, observations, journal entries and interviews are ways in which a researcher gathers qualitative data. The analysis process involves looking for themes, coding information, and coming up with patterns in the data.

- **Scholarly Resources**: Resources from a credible scholarly organization or publication. These include books, journals, and primary resources.

- **Student Self Evaluation**: Students engage in reflection of personal academic growth based on a prompt or performance standards provided by the teacher.

- **Tiered Assignments:** In a heterogeneous classroom, a teacher uses varied levels of activities to ensure that students explore ideas at a level that builds on their prior knowledge and prompts continued growth. Student groups use varied approaches to explore essential ideas (Tomlinson, 2001, p.101).

- **Vocabulary:** Vocabulary is defined as, **"**The stock of words used by or known to a particular people or group of persons. The words of a language. Any collection of signs or symbols constituting a means or system of nonverbal communication (Vocabulary, n.d.)."

References

Holly, M., Arhar, J. & Kasten, W. (2005). *Action research for teachers: Traveling the yellow brick road(2nd ed.)*. Upper Saddle River, NJ: Pearson Education, Inc.
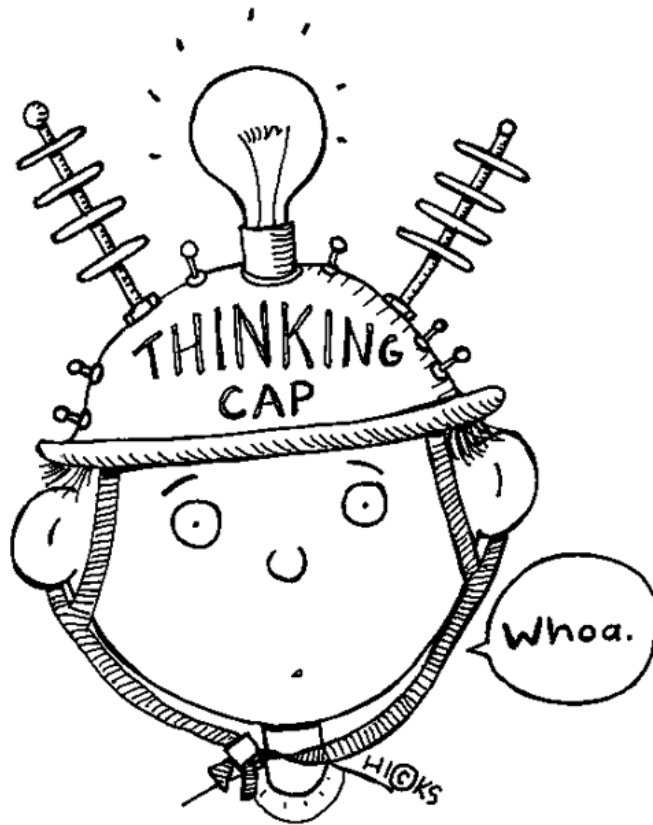
Tomlinson, C. (2001). How *to differentiate instruction in mixed-ability classrooms* (2nd ed.), Arlington, VA: ASCD.

Vocabulary. (n.d.) *Dictionary.com Unabridged* (v 1.1). Retrieved May 29, 2007, from Dictionary.com website: http://dictionary.reference.com/browse/vocabulary.

ACTION RESEARCH PLAN:

STUDENT REFLECTION, SELF-EVALUATION, AND VOICE

INTRODUCTION OF LITERATURE REVIEW

The current education system has placed incredible pressure on students and teachers to perform well under close scrutiny, especially in the realm of mathematics. According to the Education Alliance (2004),

> "research has consistently shown that student engagement strongly relates to success or failure in school; more engaged students generally show higher achievement" (3).

When students are given the opportunity to reflect on their learning and evaluate themselves, they are engaging themselves in the learning process. If students were to consciously focus on the thinking involved in the process of learning mathematics, they are more likely to increase their competence and confidence in their problem solving ability (Spruiell, n.d.). This meta-cognitive approach could result in an increase in student achievement. Teaching and incorporating student reflection and self-evaluation is important, especially in a mathematics classroom; "mathematical power comes with knowing how much we know and what to do to learn more" (Van De Walle, 2004, 71).

THE SIGNIFICANCE OF STUDENT REFLECTION AND SELF EVALUATION

Students have taught themselves to compare their achievement with that their peers and they have begun drawing conclusions about their own abilities through competition. The students are "focused on whether, rather than how, they can accomplish a task" (Bempechat, 1999). Reflection creates the opportunity for students to evaluate their learning strategies and to assess any improvements they can make in order to progress in their own learning.

To better address the crisis in education today, the students need to have more responsibility and power placed into their own hands. When students are asked, they

"have much to say about teaching and learning that can help schools become more effective education environments for them, and as such, student voice can be a powerful tool for improving student performance and closing the achievement gap" (The Education Alliance, 2004, 3).

Schools are not all performing at the same level and countless research has been conducted as to why this is true and what can be done to correct the problem. Although there are multiple factors to consider in this dilemma, looking at the use of student voice in schools could point researchers down a new path. The "evidence about the positive effect of self-evaluation on student performance is particularly convincing for difficult tasks, especially in academically oriented schools, and among high need pupils" (Rolheiser & Ross, n.d., 1).

THE STUDENT'S ROLE

Student reflection and self-assessment is one of the aspects of teaching and learning that puts the majority of the work in the students' hands. Incorporating this idea of student voice into curriculum is asking students

"to strive to understand what success looks like, to use feedback from each assessment to discover where they are now in relation to where they want to be, and to determine how to do better the next time" (Stiggins, 2006-2007, 44).

This approach cannot be successful without a significant amount of student involvement.

Student-led conferences are a great opportunity to incorporate student voice and reflection into the classroom. The "students take charge of explaining the nature of their

successes and describing areas in which they are working to improve" (Anderman & Guskey, 2008, 13). These conferences not only enhance students' ownership of their learning but also promote parent involvement in school activities (Anderman & Guskey, 2008, 13). Although student conferences are predominantly seen in the Elementary schools, it would be beneficial to adapt the idea to fit the secondary schools, especially when addressing concern for students who are not performing at their highest potential with the parents or guardians.

THE TEACHER'S ROLE

Teacher's are responsible for developing the environment of their classroom and the particular classroom structure that the teacher decides upon is "communicating a view of success and failure to their students that can have a critical impact on children's beliefs" (Bempechat, 1999). Once the teacher has established a healthy environment where students can view the concept of success as obtainable, the content can be presented to the class. The method by which that is done will vary between districts, departments, and teachers. However, the teachers must learn to balance the use of direct instruction, facilitating, and coaching within their teaching; "when used appropriately, all three of these methods help teach for understanding" (McTighe & Wiggins, 2008, 38). Regardless of ones own learning style, the teacher must play all three roles in order to create a positive learning environment.

Once student reflection and self-evaluation has been incorporated into the curriculum and routine of a classroom, it is important to be candid with the students as to why they are taking the time to complete the reflective activities (Van De Walle, 2004, 71). When explaining the purpose of the activity, the teacher should encourage students

to be completely honest in their evaluations and reflections. This will be a learned process and may not feel completely success when initially implemented in the classroom. It will be important to remember that, "teacher's honor student voice by inviting, encouraging, affirming, supporting, mentoring, and responding with honest" (Tomlinson, 2008, 29). It is not enough to simply set the stage for success and then fabricate the process; the teachers must be transparent as possible about the purpose of each activity in order to retain student trust.

THE MYTHS

Trusting that the teacher wants what is best for them as individuals is a challenge for many students. They believe that their successes are attributed to the teacher instead of their own efforts, thoughts, and abilities. A common misconception among students is that teachers are seeking a particular response from their students and anything the students say otherwise is incorrect (Zmuda, 2008, 39). The challenge for teachers and for me will be to provide feedback in a manner that does not diminish students' thoughts and ideas. Also in regards to that feedback, teachers tend to be hesitant about providing opportunities for students to revise their work. Many are convinced that few, if any, students will actually use the feedback to improve (Zmuda, 2008, 42). This notion of reviewing past work often conflicts with the desire to move faster through material in order to teach more content during the school year. It is often forgotten that, "the mission of high school is not to cover content, but rather to help learners become thoughtful about, and productive with, content" (McTighe & Wiggins, 2008, 36). With that mission in mind, speed becomes less of a concern and learning is emphasized.

The greatest argument against student reflection and self-evaluation is that it requires too much of the curriculum time to implement. However, Stiggins (2006-2007) is arguing to the contrary; "frequent self-assessments provide students (and teachers) with continual access to descriptive feedback in amount they can mange effectively without being overwhelmed" (44). Reflection and self-evaluation can easily become time consuming when they are first being introduced to a classroom, but with practice they will easily become part of the classroom routine.

RECOMMENDATIONS FOR USE IN MY CLASSROOM

In order for students to use reflection and self-evaluation to their learning advantage, they will need plenty of practice and opportunities to cultivate the skill. Incorporating "an open-ended writing prompt in a journal works well for self-assessment…a single prompt can become familiar to students if used on a regular basis" (Van De Walle, 2004, 71). By including journaling as a staple in my classroom, reflection on the learning targets and their progress will become routine and the students can learn how to make the process more useful to them.

According to Tomlinson (2008), student-led discussions, small group, and whole class discussions are all strategies that teachers should incorporate into their teaching to help cultivate student voice (29). The students in my current math classes at Mt. Spokane are not familiar with student voice within the mathematics curriculum and they may need these discussions to adjust to the concept. After discussing the current material and strategies, I plan to use the information gathered to adjust my teaching method if necessary.

An excellent idea for student voice that I would like to use in math was presented by Rick Stiggins (2006-2007) in his article entitled Assessment Through the Student's Eyes. He suggested that students "create practice versions of multiple-choice test that parallel the content of an upcoming exam which they can use to analyze their own strengths and weaknesses" (44). The practice exams that I create may only be useful to half of the students in the classroom but when the students take on this task instead of me, they will be focusing their time only on the areas relevant to their learning needs.

William Damon (2008) summarizes most of the beliefs expressed in literature regarding student voice with the notion that "only when students discover personal meaning in their work do they apply their efforts with focus and imagination" (10). When students allow themselves to use their imagination in the classroom, they exponentially broaden their horizons. Student reflection and self-evaluation is not about finding the right answer. It is about students stretching their minds to think about what they are learning, how they are learning it, and what more there is to learn.

Research Question

The primary focus of this study seeks to answer the question of whether or not incorporating student voice into the classroom can improve students' achievement and motivation levels in Geometry. The MIT candidate will be exploring how self-assessment and reflection changes students' attitudes about mathematics and as a result improve their performance.

Purpose

The purpose of this study is for the MIT candidate to determine the impact of integrating student voice and student reflective voice on student achievement levels in the Geometry classroom. When students are given the opportunity to reflect on their efforts and put learning into their own language, they focus their attention on internal factors of success rather than external influences. Implementing self-assessment and encouraging student-led instruction will provide the MIT candidate insight into the students' perspectives on learning mathematics.

Classroom Setting

The Geometry students at Mt. Spokane High school are typically at the sophomore level but there are several ninth and eleventh grade students in the classroom as well. The students in classroom A have gradually portrayed an external locus of control with respect to their achievement in mathematics.

Curricular Context

Second semester Geometry begins with a unit on polygons and area; this opening

sequence is the foundational knowledge for the subsequent chapters. Gathering information in

student voice during this chapter will aid the MIT candidate in gauging the students'

understanding of the material while simultaneously influencing the students' learning habits in

the Geometry class. This transition period between first semester and second semester will be the

opportune time to introduce a new element, such as student voice, into the classroom.

EALRs and GLEs
Table #1
Essential Academic Learning Requirements for Mathematics

Mathematics 1.1.8	Apply estimation strategies to determine the reasonableness of results in situations involving multi-step computations with rational numbers including whole number powers and square and cube roots.
Mathematics 1.2.3	Understand how to convert units of measure within systems.
Mathematics 1.2.6	Understand and apply strategies to obtain reasonable measurements at an appropriate level of precision.
Mathematics 1.3.2	Apply understanding of geometric properties and relationships.
Mathematics 1.5.6	Apply procedures to solve equations and systems of equations.
Mathematics 3.3.1	Analyze results using inductive and deductive reasoning.

Learning Goal

The students will be able to determine the area of any given polygons while also

practicing the guess-and-check method.

DESCRIPTION OF ACTION RESEARCH PLAN

Criteria for Research Question

Students often attribute external factors to their lower achievement levels in mathematics. Incorporating opportunities for students to reflect upon and assess their contributions to their own learning may draw attention away from the external factors and cause them to look inward. In order to assess the impact of student voice, the MIT candidate must assess a change in the students' attitudes about Geometry as well as their sense of control over their learning.

Description of Data Needed

Prior to beginning the study, the MIT candidate must have an understanding of the students' current perspectives on Geometry. This can be done through analyzing student generated artifacts, recording observations, as well as through inquiry. The student generated artifacts are the students' raw homework scores from the previous semester or their scores from the first week of school if the student is new to the class (See Appendix 9A). The MIT candidate will then document the completion rates of the students using a tally sheet for an individual (See Appendix 9B), sub group #1 (See Appendix 9C), sub group #2 (See Appendix 9D), and for the whole class (See Appendix 9E). The entire results will be recorded into a data table displaying the results as final figures (See Appendix 9F). The final piece of information the MIT candidate will need is the students' current attitudes about Geometry and their ability to succeed. This will be assessed using a student attitude survey created by the MIT candidate (See Appendix 9G). The results of the survey and the statistics generated from the homework will provide the MIT candidate with an overview of the students' general idea of Geometry prior to the introduction of student voice.

Figure #1
Learning goal and assessment alignment

Learning Goal:	Tested Population	Description of Assessment	Student Voice	Rationale for Use
Baseline Assessment	*Whole Class*	*-Document current homework grades (or last semester grades)* *-Document homework completion rates (first few assignments)* *-Administer a student attitude survey*	*-Students will share their opinions about math and their engagement with the material*	*-This data will provide a baseline to compare student progress against.*
Formative Assessment	*Whole Class*	*-Track homework grades and-Track assignment completion rates* *-Students create exam questions from their notes and reflect upon how doing so may help them, what do they still need to study, and if writing the questions helped them feel more in control of their learning (See Appendix 9H).* *- Students evaluate their exams through a chart which will show if most of their errors are from minor mistakes or from missing the idea (See Appendix 9I).*	*-Students created the questions and completed a self reflection activity. The students will write about what they could do to improve their score on the next exam and set goals for the coming chapter.*	*-Can monitor increase or decrease in homework rate (measure student attitude and engagement)* *-Observe the effort involved in developing questions, shows the students' perspectives on learning and their effort.*
Summative Assessment	*Whole Class*	*-Chart growth in homework scores, completion rates.* *-The students will rate their current perceptions of math, their involvement with their learning and the ability to achieve (same attitude survey as pre-assessment).*	*-The students will be reflecting on their learning and their own states of mind.*	*-The charts can show quantitative growth.* *-I can compare the results from the pre-assessment with the summative assessment with the student responses.*

Description of Analysis Process

The primary purpose of this study is to observe the impact student voice and self-assessment has on student attitudes and achievement levels. Although this information will be documented in tables, the data collected will primarily be converted into graphs and charts to visually display the trends occurring in the classroom over time. Homework score averages from the beginning of the study will be compared to the averages gathered at the midpoint, as well as from the end of the study. This will be done in a column chart, placing the averages side-by-side for the whole group, the two subgroups, as well as the individual. The homework completion record for the whole class will be displayed in a line graph to better display the progression over the course of the ten assignments (See Appendix 9K). This graph will show to what extent each assignment was completed and whether or not it was turned in on-time, late, or not at all. The data for the subgroups and the individual will be displayed in pie charts which will easily provide a snapshot of the student and group's generalized homework completion patterns (See Appendix 9L). The comments noted for each group will act as a formative assessment for MIT candidate rather than quantitative data to be measured (See Appendix 9B, 9C, 9D). As for the student attitude surveys, those will also be displayed in a column chart comparing the pre-assessment and the final assessment results (See Appendix 9M). During the study, the students will answer four reflection questions. Those questions will act as a formative assessment for the MIT candidate, but they can also be displayed in a yes and no chart (See Appendix 9N). Having this presented graphically will be a valuable indicator of how successful the review activity was.

Description of Subgroups and Individual Selection

For this particular study, the MIT candidate will examine the impact of student voice and self-assessment on the class as a whole, as well as examine the influence on two particular sub groups and one individual. The sub groups for this research plan will be the students with sophomore standing and the ethnically diverse students.

At Mt. Spokane High School, the Geometry courses are primarily comprised of sophomores. However, there are some freshmen with a more extensive math background, and some juniors making their second attempt at passing Geometry also in the course. The MIT candidate would like to draw conclusions about the typical students in a Geometry class and therefore, for the purposes of this action research plan, will examine the data from the 10th grade subgroup. Looking closely at the ethnically diverse students will also be important for this study. As stated in School and Community Culture, the students at Mt. Spokane High School are 92% Caucasian; according to statistics, the students of varying ethnicities are underrepresented. It would be helpful to see how these same students feel about their involvement in the classroom with the inclusion of student voice in the mathematics routine.

The individual the MIT candidate has selected for this study is a female teenager from Hawaii. This student has many negative remarks about Geometry on a daily basis, and is more interested in the social scene of high school than the academics. Many of the negative comments allude to the idea that she was born incapable of succeeding in math. This research plan will provide the MIT candidate an opportunity to better understand the origins of this belief and perhaps alter the student's perspective on Geometry and math as a whole.

Validity

"If the purpose of the study is purely to inform your own education practice, you may wish to focus on truth value validity, outcome validity, and catalytic validity" (Hendricks, 2009, 113). Truth value validity focuses on the accuracy of the study's results and findings. The MIT candidate is using triangulation, member checks, and peer debriefing to ensure truth value validity has been accounted for in this study. The member checks will be less formal and be done with an exit card. The MIT candidate will conclude a lesson by sharing some of the developed inferences drawn from the results available up to that point. The students will then record on a note their interpretation of the accuracy of those results. The MIT candidate will also debrief with the other MIT candidates at Mt. Spokane High School to ensure biases have been accounted for and excluded from the data interpretation.

Outcome validity and catalytic validity address the "ability of the study to increase understanding, resolve problems, and transform practices" (Hendricks, 2009, 115). The MIT candidate is gathering quantitative data from a variety of sources to increase the probability of an unbiased data presentation. However, the MIT candidate is not neglecting the necessity of reading student responses subjectively to improve instruction during and after the study. Studying the impact of student voice and self-assessment provides the students and the MIT candidate with more opportunities for communication through the content. This study is looking directly at the students and asking for feedback. The results will guide future lessons, and could easily translate across content areas to improve the MIT candidate's ability to teach other subjects beyond mathematics.

General Timeline

FALL 2008:

Review of Literature

Submit Application to university Institutional Review Board to secure permission for study

WEEK ONE (February 2-Febraury 6):

    Gather student homework averages

    Begin documenting student completion rates

February 2- Administer Student Attitude Survey

February 3- Document homework completion rate Assignment 1

February 4/5- Document homework completion rate Assignment 2

February 6- Document homework completion rate Assignment 3

WEEK TWO (February 9-February 13):

    Document homework completion rates

    Document homework averages

February 9- Document homework completion rate Assignment 4

February 10- Document homework completion rate Assignment 5

February 11/12- Document homework completion rate Assignment 6

    Document homework averages

February 13- Document homework completion rate Assignment 7

WEEK THREE (February 16-February 20)

    Document homework completion rates

    Document homework averages

February 16- Document homework completion rate Assignment 8

February 17- Document homework completion rate Assignment 9

February 18- Document homework completion rate Assignment 10

February 19- Exam Review: Students generate exam questions and answer reflection questions about the review activity process.

Feb 23- Students Evaluate exams for minor errors and develop learning goals for themselves for the next chapter.

Feb. 24- Administer Student Attitude Survey

    Document Homework Averages

WEEK FOUR (February 23-27)

    Data Analysis (Convert tally sheets, student responses, and homework scores into graphs and charts).

Introduction of Data Analysis

Prior to opening the study, the MIT candidate documented the current homework score averages for the whole class, the two sub-groups, and the individual (See Appendix 9A). Throughout the study, the homework completion levels were documented using the whole class, sophomore students, ethnically diverse students, and student A tally sheets (See Appendix 9B, 9C, 9D, 9E).

The MIT candidate began the study by asking the students to complete a survey regarding their current attitudes about Math and Geometry (See Appendix 9G). The survey was administered on the first day as to get the most accurate read prior to including any "student voice opportunities". Throughout the study, the students determined the order in which activities would be completed in the classroom. They would then provide oral feedback at the end of the class period as to how well that worked for them. This brief moment of reflection was time for each of them to think about their own learning process and ways to adjust their approach if necessary. Some students chose to correct their homework at the end of the period instead of the beginning, while others thought the class functioned well but thought they should sit away from their friends. The informal reflections were also acclimating the students to an intrinsically motivated environment where self-assessment can be honest and beneficial.

After adjusting to the MIT candidate's teaching style and the introduction of self-assessment and reflective voice, the students completed an activity in which they developed their own exam questions prior to the test (See Appendix 9O). This was intended for them to assess what they knew, what they still needed to study, and some of their questions were chosen for the exam. It gave them control over their learning while acting as a self-assessment. This was the

point when the MIT candidate discovered the study needed to be extended to include more opportunities for self-assessment and reflective student voice.

One extension to the study was to add an additional follow-up assessment for the exam. The MIT candidate asked the students to look at what they answered incorrectly and analyze why they missed the problem; the students were to decide if their error was a simple mistake, if they completely missed the mark, or if they simply ran out of time (See Appendix 9I). They were then to reflect upon their mistakes and set goals for the following chapter (See Appendix 9P). A final extension to this activity was to include the parents. The students involved their parents by sharing their goals with a family member and returning to class with a signature verifying the conversation took place. The purpose behind the parent involvement was to make this experience a team effort. This added element asked the students to think harder about their goals. Making commitments aloud and sharing goals with others helps students make their goals more important. This also gave the students a chance to show their family the ownership they were taking in their learning.

To conclude the study, the MIT candidate re-administered the student attitude survey about Math (See Appendix 9G). The students were asked to complete the survey as honestly as possible and were reminded that the information would not impact their grade. After the study was considered closed, the MIT candidate recorded the homework scores.

Evidence of Impact on Student Learning

Administrators, school boards, the state board of education, and the federal government tend to rely heavily on measurable academic growth, with that in mind, the first set of data the MIT candidate studied with respect to the impact on student learning was the homework score averages (See Appendix 9A). At the midpoint of the study, the homework score averages for the whole class, both of my subgroups, and the individual had improved by as much as 8%. Although not all of the assessment groups improved as dramatically, each of them increased. The summative assessment shows at least a 4.86% improvement and as much as a 14% increase in the scores (See Appendix 9J). There are many contributing elements to be sited for such growth, yet the numbers are significant enough to determine that student voice had played a pivotal role in the students' success. The individual from Hawaii (from individual assessment group) spends much of the class time talking to anyone who will listen to her; the results showed the individual was exponentially more successful in class with the introduction of student reflective voice. Using the students' desire to talk and express themselves as a tool for success in the classroom has been an effective teaching strategy for the MIT candidate.

Tests and quizzes are other key elements in a student's score in a math class. For the in-class test review, the MIT candidate asked the students to create their own exam questions and then reflect upon the process (See Appendix 9H and 9Q). The responses from the students varied, but as a whole, the data indicated the method was helpful, it gave the students more control over the exam, and they felt an increased likelihood of success entering the exam (See Appendix 9N). This activity helped make the connection between the mental aspect of math and the actual performance element. These responses were also helpful feedback for an MIT candidate experimenting with new techniques in the classroom.

As a future teacher, the MIT candidate wanted to explore beyond academic achievement by also looking at motivation and assignment completeness. To measure the assignment completion rate, the MIT candidate used a separate tally sheet for the individual, each of the subgroups, as well as the whole class (See Appendix 9B, 9C, 9D, 9E). This information was then transferred to a whole class assignment completion record in a table format and in a graph to help visualize the results (See Appendix 9F, 9K). The data from the individual and the two subgroups was also transferred to pie charts to give a bigger picture of the information (See Appendix 9L). The fluctuation in the data from each of the graphic organizers does not appear to reveal information about student motivation in either a positive or negative manner. The results were inconclusive which led the MIT candidate to refer to the student attitude survey (See Appendix 9M).

The three statements the MIT candidate examined closely were, "My success in Geometry is determined by the effort I put into the class", "I like Geometry", and "Geometry can be easy if I try harder". These statements target the purpose of the study by revealing information about the students' locus of control. For the first two statements, each of the assessment groups' attitudes became more positive with the exception of the ethnically diverse students. The MIT candidate studied the possible contributing factors to these results and concluded that the three ethnically diverse students also had low attendance in all of their classes for the duration of the study. The responses may have been different had they attended more of the classes. The third statement, "Geometry can be easy if I try harder", had mixed responses between the pre-assessment and the summative assessment. The individual and the whole class both showed improvement in their attitude by shifting in the positive direction between the two assessments. However, the subgroups displayed an increased negative attitude about the difficulty of

Geometry in the summative assessment. The advanced nature of the material could be a contributing factor to their responses. This unit is particularly difficult for students because it requires some spatial reasoning ability and many of the students have not developed that skill yet.

Insights on Effective Instruction and Assessment

The general overview of the data clearly indicates that the class as a whole benefitted greatly from the incorporation of student reflective voice and self-assessment in the math classroom. The homework scores are the first indicator of success because the whole group, both of the subgroups, and the individual showed improvement. The students were finally given an opportunity to take ownership of their learning and they responded well to the responsibility. Students are convinced too early that they are not in control of their math learning, but this strategy demonstrates otherwise. The method in which the MIT candidate slowly introduced self-assessment and reflective voice created a comfortable environment, which opened doors for the students to be honest with themselves about their own learning and ability.

Despite the MIT candidate's best effort, the group that appears to have benefitted the least was the ethnically diverse subgroup. Academically the students improved and were successful in the course, but their attitudes about Math and Geometry showed a negative inclination. The MIT candidate would be wise to repeat this study with another group of students to determine whether or not the significant number of absences was contributing to the ethnically diverse students' attitudes about math.

Implications For Future Teaching

Witnessing the transformation of the classroom environment after the introduction of student reflective voice and self-assessment is almost as powerful as watching the academic

performance of those same students improve. To continue this success, educators must treat student reflective voice and self-assessment as a necessary element in the classroom. The streamlined congruence between self-created exam questions, student assessment of exam mistakes, and goal setting as a result of this reflection encourages both academic and personal growth without compromising valuable teaching time. Consistent incorporation of reflection and self-assessment helps the process become natural to the student and provides valuable formative assessment for the teacher to better meet the needs of the students in subsequent lessons.

Teaching requires many hours outside of the classroom as a natural requirement of the job; although it seems tedious to attach research to the teaching job description, the impact appears to be worth the additional time and effort. The process which occurs prior to the research has the potential to be just as powerful as the actual research itself. Generating tables, rubrics, surveys, and other assessment tools, compels the teacher to think about the students, the content, the curriculum, and his or her vision for teaching and learning. All of these elements must be accounted for when formulating an action research plan; the teacher becomes much more aware of the classroom environment and the students' needs when conducting action research in the classroom. The MIT candidate has made a commitment to life-long learning, and action research is a great way to remain involved in the learning process.

Appendix 9A

Table #2
Homework score averages

Assessment Group	Pre-Assessment	Formative Assessment (Midpoint)	Summative Assessment
Whole Class	85.3	86.4	90.3
Ethnically Diverse	86	88.1	90.86
Sophomores	83.46	86	89.1
Individual	54	62	68

Appendix 9B

Figure #2
Individual assignment completion tally sheet and comment section

	On Time & Completed	On Time & Incomplete	Late & Completed	Late & Incomplete	Not Turned In
INDIVIDUAL					
Total					

Assignment #	Comments
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Appendix 9C

Figure #3
Sub-group #1 assignment completion tally sheet and comment section

	On Time & Completed	On Time & Incomplete	Late & Completed	Late & Incomplete	Not Turned In
Sub-Group 1					
Total					

Assignment #	Comments
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Appendix 9D

Figure #4
Subgroup #2 assignment completion tally sheet and comment section

	On Time & Completed	On Time & Incomplete	Late & Completed	Late & Incomplete	Not Turned In
Sub-Group 2					
Total					

Assignment #	Comments
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Appendix 9E

Figure #5
Whole class assignment completion tally sheet and comment section

	On Time & Completed	On Time & Incomplete	Late & Completed	Late & Incomplete	Not Turned In
Assignment 1					
Assignment 2					
Assignment 3					
Assignment 4					
Assignment 5					
Assignment 6					
Assignment 7					
Assignment 8					
Assignment 9					
Assignment 10					
Average Total					

Appendix 9F

Table #3
Whole class assignment record

	On Time & Completed	On Time & Incomplete	Late & Completed	Late & Incomplete	Not Turned In
Assignment 1	26	1	3	0	1
Assignment 2	23	0	6	2	0
Assignment 3	20	2	5	3	0
Assignment 4	30	0	0	0	0
Assignment 5	24	4	0	0	3
Assignment 6	25	5	1	0	0
Assignment 7	21	3	3	0	4
Assignment 8	18	3	6	0	3
Assignment 9	27	0	2	1	0
Assignment 10	24	0	3	0	3
Average Total	23.8	1.8	2.8	.6	1.4

*Complete: All questions answered/attempted
*Incomplete: Some questions not answered/attempted
*On Time: Turned in at specified time and date
*Late: Turned in after specified time and date

Let's Talk About Math

Name:_____
(You will receive a 5 pts if you complete this and 0 pts if you do not. Your responses will be used solely for research and will not impact you negatively in this course.)

1. Geometry can only be learned by people who are born with math talent.

←0   1   2   3   4   5   6   7   8   9   10 →
FALSE   Sometimes   TRUE

2. I am a person born with math talent.

←0   1   2   3   4   5   6   7   8   9   10 →
FALSE   Sometimes   TRUE

3. Geometry can be easy if the teacher presents the material the *right* way.

←0   1   2   3   4   5   6   7   8   9   10 →
FALSE   Sometimes   TRUE

4. Geometry can be easy if I tried harder.

←0   1   2   3   4   5   6   7   8   9   10→
FALSE   Sometimes   TRUE

5. I like Geometry.

←0   1   2   3   4   5   6   7   8   9   10 →
FALSE   Sometimes   TRUE

6. I try harder in Geometry than my other classes.

←0   1   2   3   4   5   6   7   8   9   10 →
FALSE   Sometimes   TRUE

7. My success in Geometry is determined by the effort I put into the class.

←0   1   2   3   4   5   6   7   8   9   10 →
FALSE   Sometimes   TRUE

Appendix 9H

Reflection on Self-Created Exam Questions

1. Was writing your own exam questions a helpful review method for the exam?

2. Did you find gaps in your understanding of the material? If so, did this help you determine what to study? Why or Why not?

3. Did the questions help you feel like you had more control over the results of the exam?

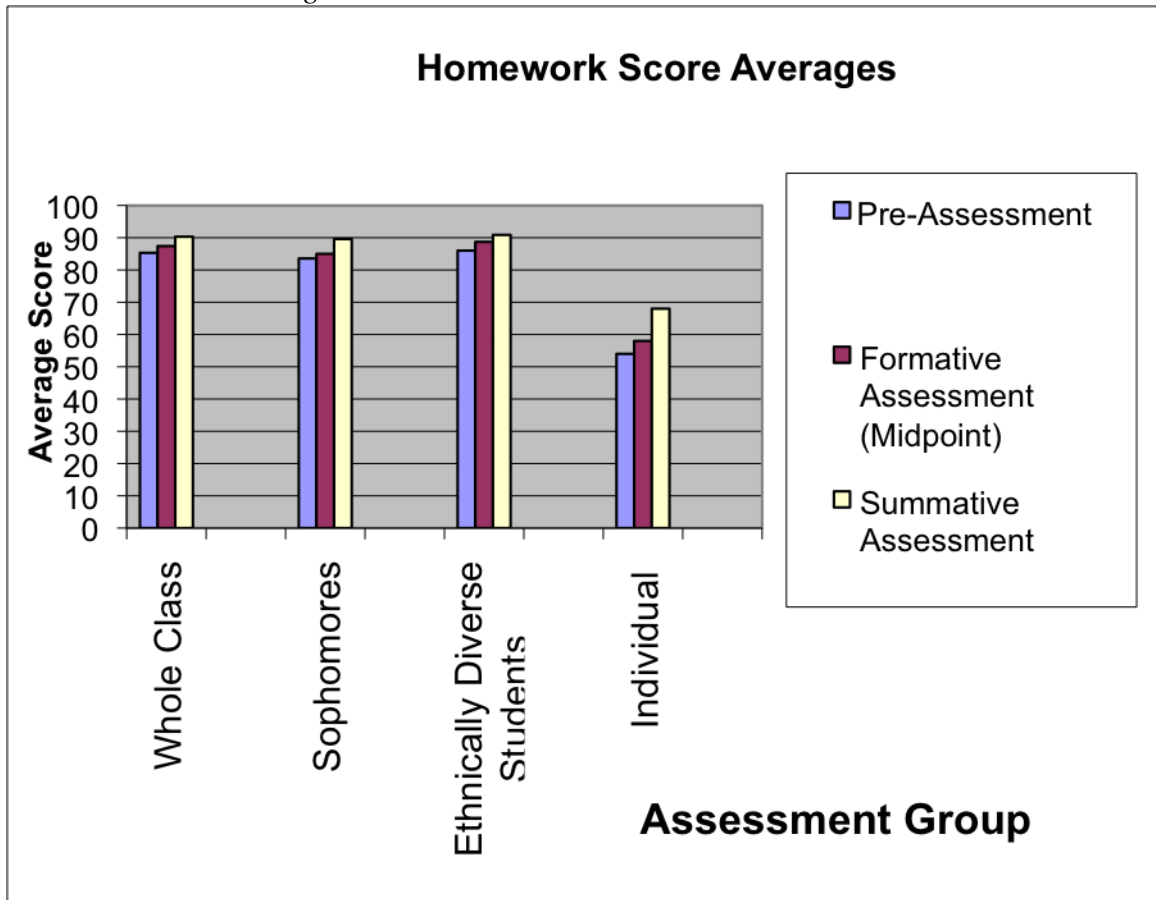4. Do you think you have a better chance of succeeding on the exam after today?

Appendix 9I

Question #	Correct	Missed, but now I understand	No Idea!
SAMPLE		X	
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

Appendix 9J

Figure #6
Homework score averages

Appendix 9K

Figure #7
Whole class assignment completion record graph

Assignment Completion Record
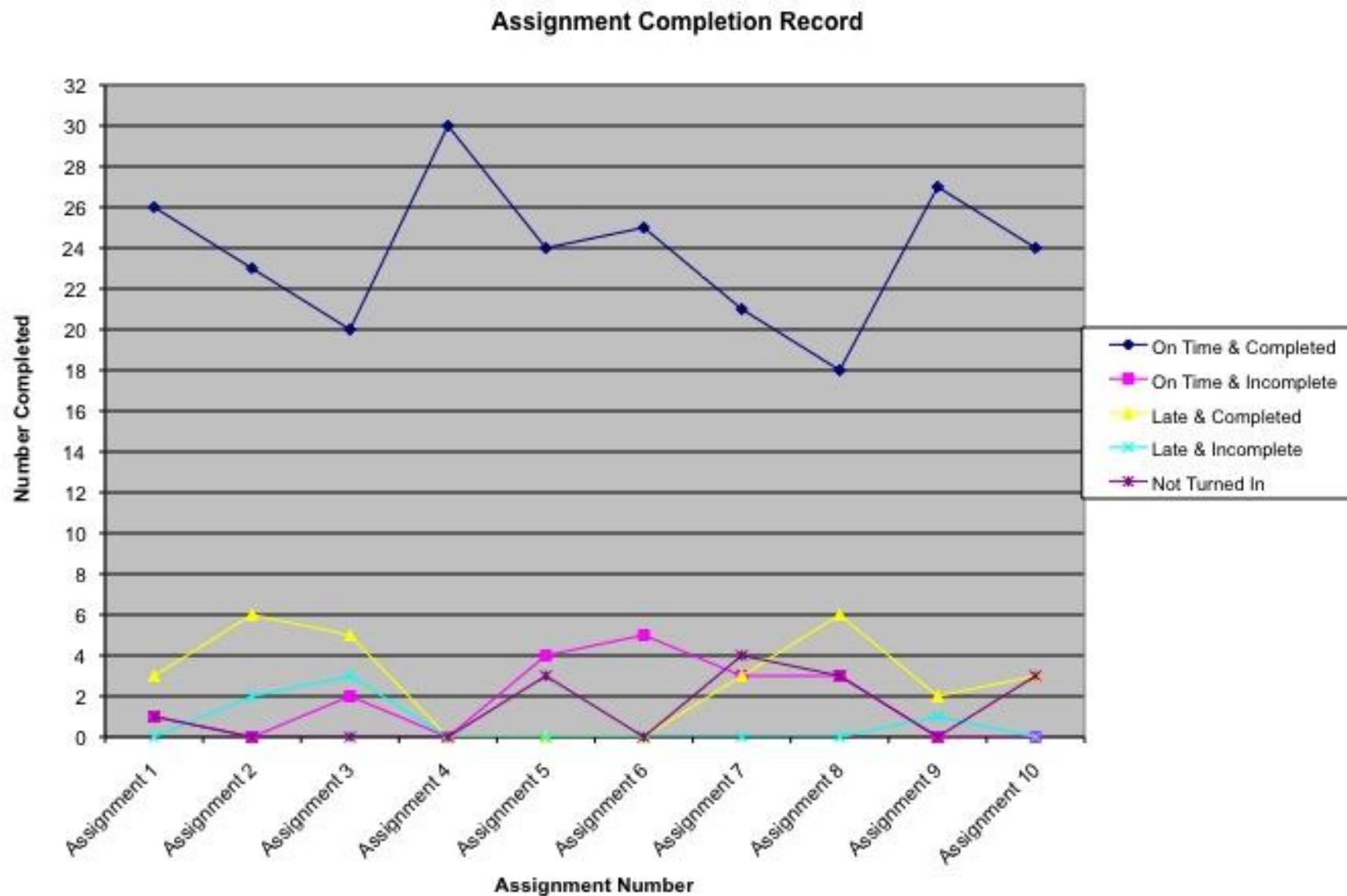
Appendix 9L

Figure #8
Assignment completion pie charts for individual, sophomores, and ethnically diverse students
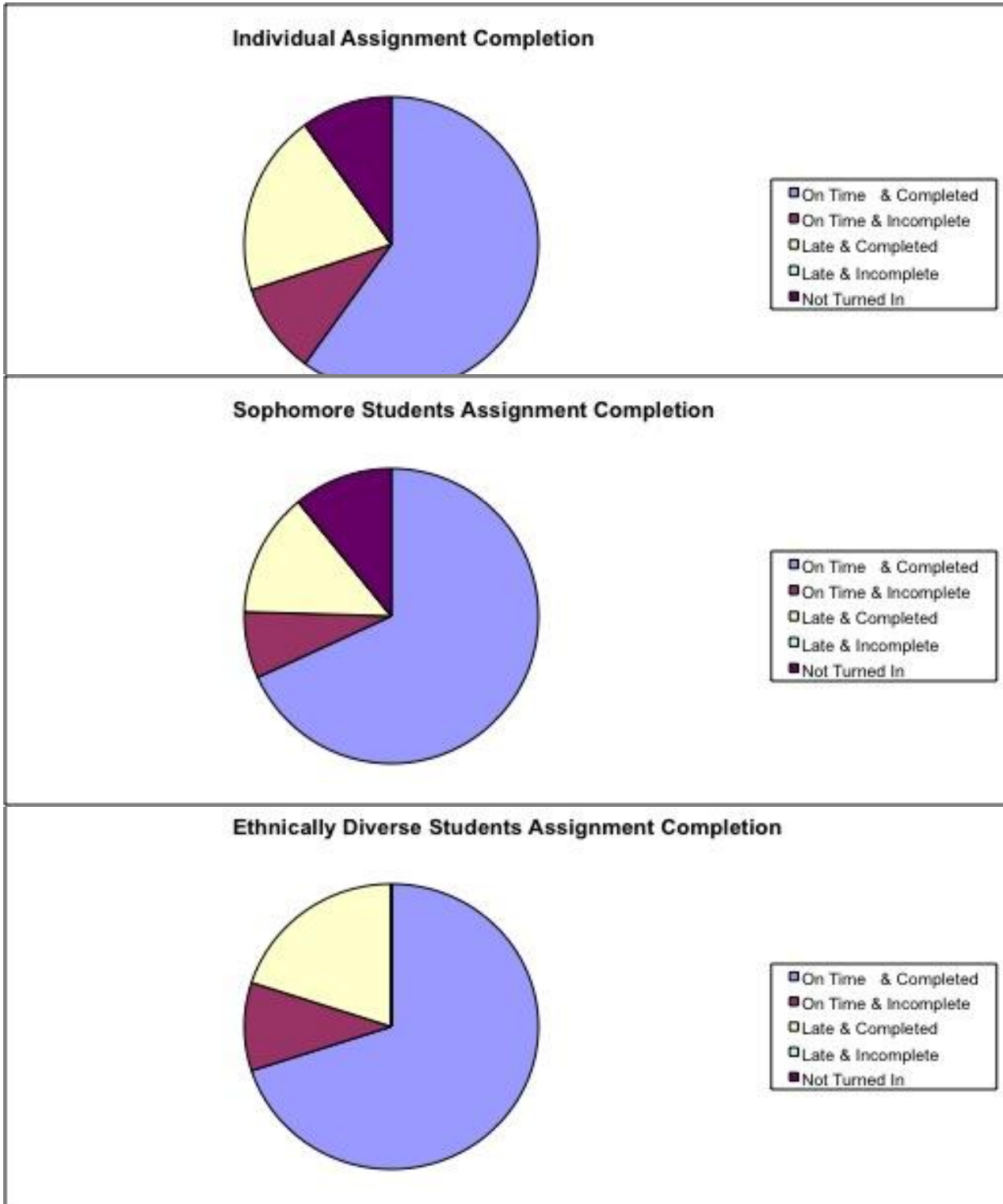
Appendix 9M

Figure #9
Student attitude survey pre-assessment and summative assessment results
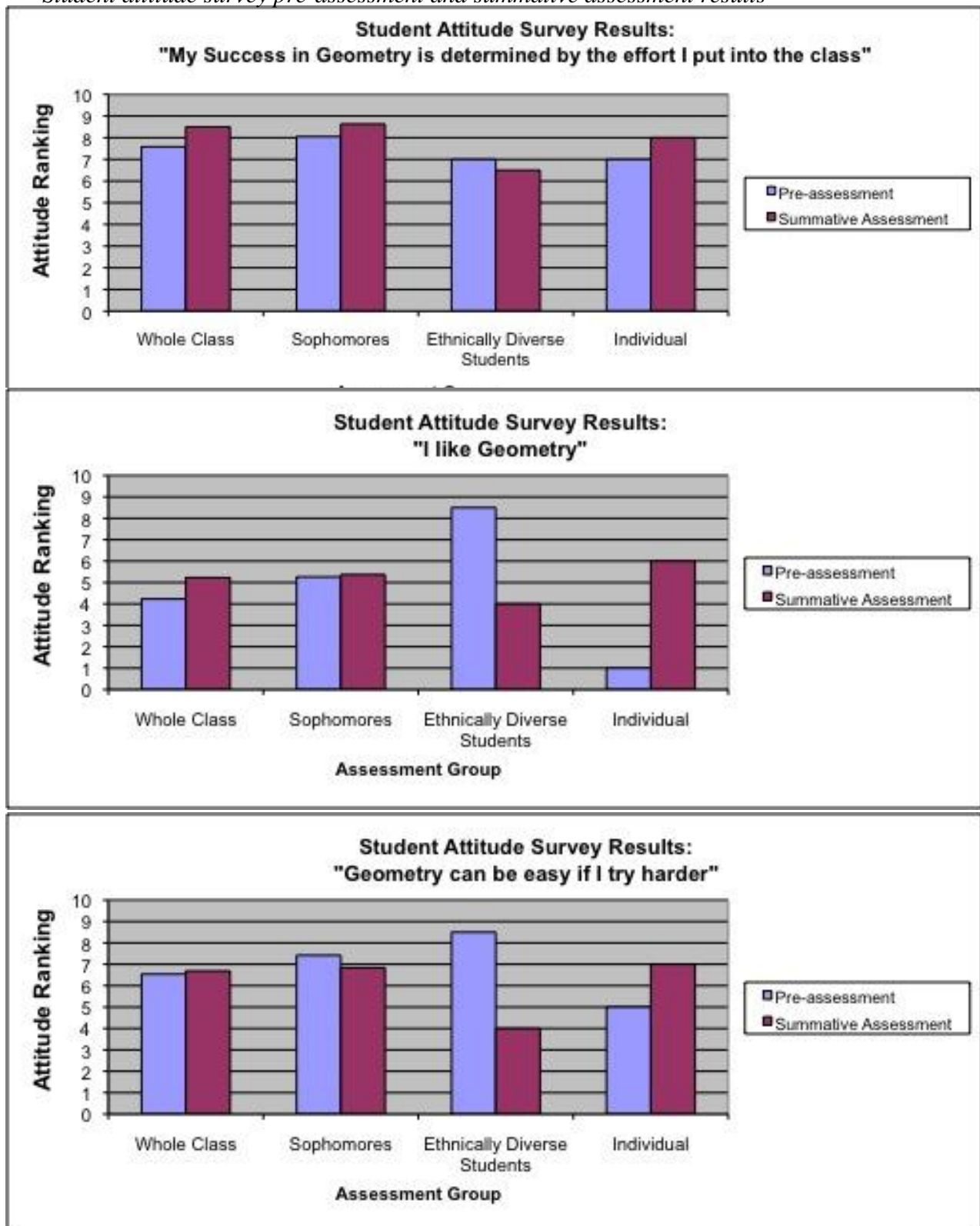
Appendix 9N

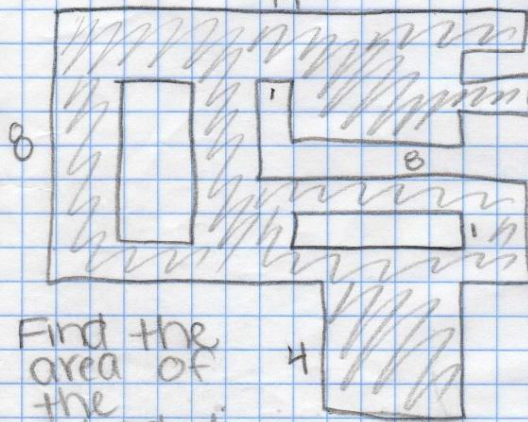Figure #10
Student responses to exam reflection questions

Reflection Questions

Number of Responses

Questions

Yes
No
other

Appendix 9O
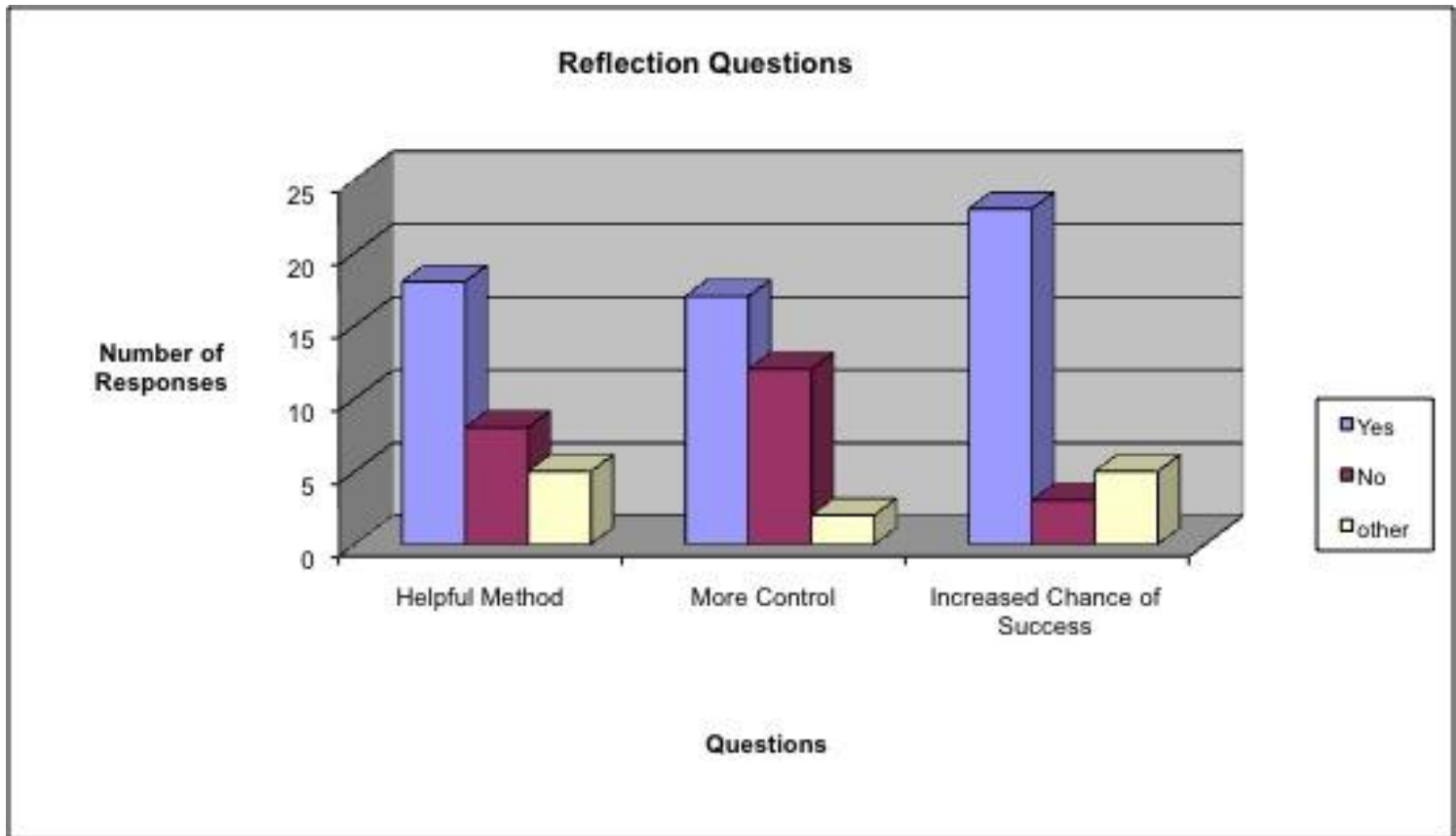
Exam Q's

10-1

The measure of an exterior angle of a regular polygon is 90.
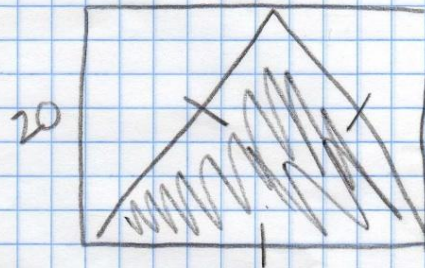
How many sides does the polygon have.

10-3

14

8

8

4

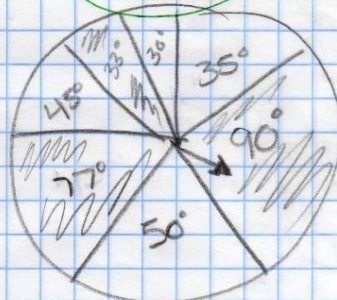Find the area of the shaded region.

10-4

s

Find the Area.

10-5

20
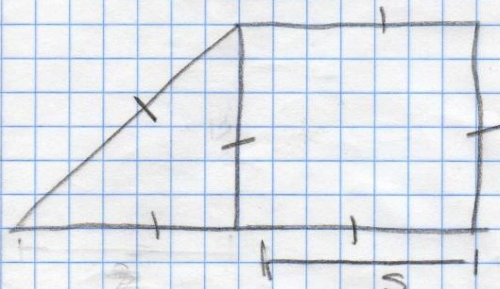
All polygons are regular.

Find the area of the shaded region.

10-6

35°

48°

90°

77°

50°

What is the probability the spinner will land on a shaded region?

Appendix 9P

If I do my homework more & completely, then that would help me on ch.11. Also, if I don't understand then go in at access time if that doesn't help me then go ask Mr. Adams if there is another way or easier

Appendix 9Q

Reflection on Self-Created Exam Questions

1. Was writing your own exam questions a helpful review method for the exam? Yes because it gave me a chance to look through some problems and understand them.

2. Did you find gaps in your understanding of the material? If so, did this help you determine what to study? Why or Why not? There were some things that I had trouble with but this helped and now I know what to look for.

3. Did the questions help you feel like you had more control over the results of the exam? Yes because I got to look at the problems I thought would be on the test so I can know what I need to look at.

4. Do you think you have a better chance of succeeding on the exam after today? Yes because I looked at the problems I was having trouble with so I understand them better.